High Resolution PFAS Plume Characterization in Fractured Sandstone to Support Groundwater Remedies

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Background/Objectives. In spring 2021, during due diligence of a natural gas peaking plant in Wisconsin, it was discovered that second generation aqueous film-forming foam (AFFF) was released onsite over time during the testing and certification of the facility's fire suppression system by a third party. Characterizing the PFAS in soil and groundwater and estimating the cost and timeliness associated with the investigation and remediation of the Site immediately became time sensitive priorities to preserve the deal. The area of AFFF storage, use, and testing was well known at this relatively new facility. The on-site potable well was impacted with PFAS from the release and posed a potential for vertical migration of contaminants down the well's open hole from near the water table (60 feet below ground surface [ft bgs] to 200 ft bgs) and introduced PFAS to the mound drain field.

Approach/Activities. The approach at the Site included soil sampling to characterize the extent of PFAS in soil and to identify potential PFAS sources to groundwater, followed by shallow well and vertical profiling methods to determine the presence of PFAS within the fractured sandstone aquifer. The results from vertical profiling (discrete interval sampling of the private well and installation and sampling Westbay® multiport wells) were assessed using 3-D visualization techniques (using EVS software) to determine the extent of PFAS constituents of concern, their migration pathways, and the potential remediation techniques needed for the Site. A robust groundwater dataset exists at this Site from the installation and quarterly sampling of seven water table monitoring wells, one deep piezometer, and five Westbay® multiport monitoring wells with eight sample ports.

Results/Lessons Learned. 3-D contouring and visualization was critical in development of the conceptual site model (CSM) and demonstrating the sources and migration pathways of PFAS in groundwater. Shallow plumes resulted from leaching of PFAS from the AFFF testing area and the septic drain field. Two deep plumes resulted from vertical migration of a shallow plume down the private well, following the regional downward vertical gradient at the Site. This migration pathway was supported by vertical profiling the private well and by separation of the shallow and deep plumes clearly shown in the 3-D visualizations. These migration pathways will be critical in supporting the groundwater remedy at the Site. Interim remedial actions at the Site were conducted in the summer of 2022 which included sealing the potable well to prevent downward migration PFAS to the deeper aquifer to allow evaluation and demonstration of monitored natural attenuation (MNA) of the groundwater plumes. The benefits of the quickly implemented surficial remedies, including removal of the septic mound drain field and capping contaminated soil, will allow evaluation of MNA for the shallow plumes.